Preparations for the Introduction of the Feed-in Tariff Scheme for Renewable Energy

[Reference Materials]

What is Renewable Energy?

○ Renewable energy is a non-fossil energy source and can be permanently used.

Already in practical use: solar light, wind energy, hydraulic energy, geothermal, biomasses, etc.

In research phase: tidal energy, wave energy, ocean thermal energy, etc.

○ Renewable energy is important from the following viewpoints.

- Global warming countermeasures
- Energy security improvement
- Fostering environment-related industries

✓ Renewable Energy at the International Energy Agency (IEA)

"Constantly replenished energy derived from natural processes"
"Energy generated by the sun, winds, biomasses, ground heat, water power and marine resources; it includes hydrogen of renewable origin"

✓ Renewable energy sources under the "Law for the Sophistication of the Energy Supply Structure"

(1) Solar light, (2) wind energy, (3) hydraulic energy, (4) solar heat, (6) heat in the atmosphere and other heats present in nature, (7) biomasses

✓ Renewable energy under the "Basic Law for Prevention of Global Warming"

(1) Solar light, (2) wind energy, (3) hydraulic energy, (4) ground heat, (5) solar heat, (6) biomasses, and (7) those non-fossil fuel energy sources that are defined by government ordinances as permanently available

(Reference) A Project Team on the Scheme for Japan's FIT (Feed-in Tariff)

○ In November last year, a "Project Team on the Scheme for Japan's FIT" consisting of three top political affairs officials of the Ministry of Economy, Trade and Industry, officials of the Agency for Natural Resources and Energy, and external experts, was launched, and the team has conducted interviews with domestic power producers, etc., as well as conducted overseas investigations, cost estimations, etc. In March this year, the team presented system options to the population, and invited opinions from the public.

◆ **Meetings held and review schedule**

November 6, 2009	Meeting (status analysis, organization of points at issue)
Late Nov. to late Dec. 2009	Interviews (1st to 5th) (Interviewees: renewable energy power producers/equipment manufacturers, energy-related businesses, think tanks, consumer organizations, industries, etc.)
Jan. 2010	Overseas visit to Europe (Spain, Italy, United Kingdom and Germany) Meeting (report on interview results, report on overseas visits, etc.) Meeting (analysis of purchase cost, technological development trends, etc.)
Mar. 2010	Meeting (interim wrap-up: presentation of options)
Apr. to May 2010	**Invited public comment about the options, held regional forums (explanatory meetings) at 21 venues across Japan**
Jun. 2010	Interviews (6th: relevant power producers, power consumers, energy industries, etc.)

◆ PT expert members

- Takao Kashiwagi, Professor, Integrated Research Institute, Tokyo Institute of Technology
- Yoshitsugu Kanamoto, Professor, Graduate School of Economics, Faculty of Economics, The University of Tokyo
- Hirotaka Yamauchi, Professor, Graduate School of Commerce and Management, Faculty of Commerce and Management, Hitotsubashi University
- Kenji Yamaji, Director-General, Research Institute of Innovative Technology for the Earth (RITE)
- Akihiko Yokoyama, Professor, Graduate School of Frontier Sciences, The University of Tokyo

Basic Idea

- Significance of introducing renewable energy.
  - "Global warming countermeasures," "energy security improvement" and "fostering environment-related industries"
- Since it is important to **strike a balance between three factors: "expanded introduction of renewable energy," "burden on the population" and "system stabilization measures,"** the basic policy is to maximize the introduction effect while reducing the burden on the population as much as possible.
- Among the options presented on March 31, the one that is based on Case 4 (see next section) is selected because this option is considered as the most appropriate from the above viewpoint.
  - It is estimated that the **increase in the amount of electricity through the introduction will be 32 to 35 million kW**, and the CO2 emissions will be reduced by 24 to 29 million tons.
  - Also aim at **expanding the renewable energy-related market to reach ¥10 trillion by 2020** through such expansion of introduction.
  - The purchase cost to be borne at an average household is estimated to be **approximately ¥150 to ¥200 per month** 10 years after the start of the system.
- Specific details on the purchase price and the system **will be studied in the future while seeing the tax for global warming countermeasures and the developments in the discussions on the domestic emissions trading system, while taking into account the viewpoints such as the burden on the population and industrial competitiveness.**
- This system will enable us not only to forcefully promote the introduction of renewable energy, but also to increase the ratio of renewable energy to the whole energy supply **by promoting technological development, reviewing relevant regulations and working on the promotion of energy conservation, etc.**

(Reference) Options on the Feed-in tariff Scheme for Renewable Energy

[Options presented in March (10 years after the start of the system)]

Case	A. Energy sources covered by the purchase system	B. Treatment of residential photovoltaic systems	C. Newly installed or existing	D. Purchase price		E. Purchase period *3		Amount through introduction (10,000 kW)	Assumed annual power generation (100 million kWh)	CO_2 reduction (10,000 t)	CO_2 reduction cost (¥/t)	Annual purchase cost (¥100 million)
1*1	A1 Any form of renewable energy	B1 Total purchase	C1 New + existing	D1 Single price*3		E3 20 years		3,773 or more	513 or more	3,075 or more	52,297 or less	16,083 or more
3					¥20	E3/E2	20 years	3,155 to 3773	397 to 513	2,382 to 3,075	25,743 to 28,854	6,131 to 8,873
					¥15		15 years					
4	A2 Renewable energy already in practical use	B2 For residential photovoltaic systems and the like, surplus amount will be purchased	C2 New only*2		¥20		20 years	3,155 to 3,474	397 to 481	2,382 to 2,887	19,407 to 21,798	4,622 to 6,292
					¥15		15 years					
5				D2 Cost-based		E2 15 years		3,102	397	2,382	20,596	4,906

*1. Since we selected 4 options from multiple cases, cases No. 2 and No. 6 are omitted.
*2. Residential photovoltaic systems and the like include existing facilities.
*3. For residential photovoltaic systems and the like, purchase price and period will separately be set.

Note: For cases 3 to 5, we made estimates without considering measures for existing facilities.

A. Type of Electricity to be Purchased

○ The energy sources covered by the purchase system should be expanded to include photovoltaic systems (expanded to those for the power business), wind power generation systems (including small types), small to medium hydroelectric systems (30,000 kW or less), geothermal power generation systems, biomass power generation systems (those not significantly affecting businesses that use bio masses for paper pulp, etc.), which are renewable energy sources already in practical use, from the viewpoint of accelerating the introduction of all types of renewable energy sources.

✓ **Those that have currently been put to practical use as renewable energy power sources should all be covered** in principle.

✓ In addition, energy sources covered by the purchase system should be **expanded to also include those for power businesses such as mega solar power generation**.

- The energy sources currently assumed to be covered by the purchase system are **photovoltaic systems, wind power generation systems, small to medium hydroelectric systems, geothermal power generation systems, and biomass power generation systems**.
- For those energy sources currently not in practical use other than those indicated above, research and development efforts and verification tests should continuously be promoted, and they will not be covered by the purchase system in consideration of the balance with the burden of the population. However, we will consider adding them to be covered by the purchase system in the future.
- Among hydroelectric systems, many of large facilities with capacity exceeding 30,000 kW would be economically operable even if they were not covered. As with overseas cases, small to medium **hydroelectric systems with capacity below 30,000 kW should be covered**.
- **As for biomass power generation systems, those not affecting businesses that use bio masses for other uses should be covered**.

[Examples of items of future study]
- Study a mechanism that enables those biomass power generation systems that are “considered not to compete with other use purposes.”
- Study necessary actions such as the establishment of an equipment certification system, with regard to ensuring/necessitating safety of power generation facilities.

B. Scope of Total Purchase

○ For facilities for power generation businesses, including photovoltaic generation systems for power generation businesses such as mega solar systems, all generated electricity should be purchased in principle. For small-scale photovoltaic systems at residences or the like, the present surplus purchase system should be applied in principle from viewpoints such as improvement of the energy conservation incentive, and a specific measure will be studied in the future.

✓ For facilities for power generation businesses including photovoltaic systems for power generation businesses such as mega solar systems, **all generated electricity should be purchased in principle**.

✓ By contrast, **for small-scale photovoltaic systems at residences or the like**, the **surplus purchase system** should be applied on an exceptional basis in principle from the following viewpoints.

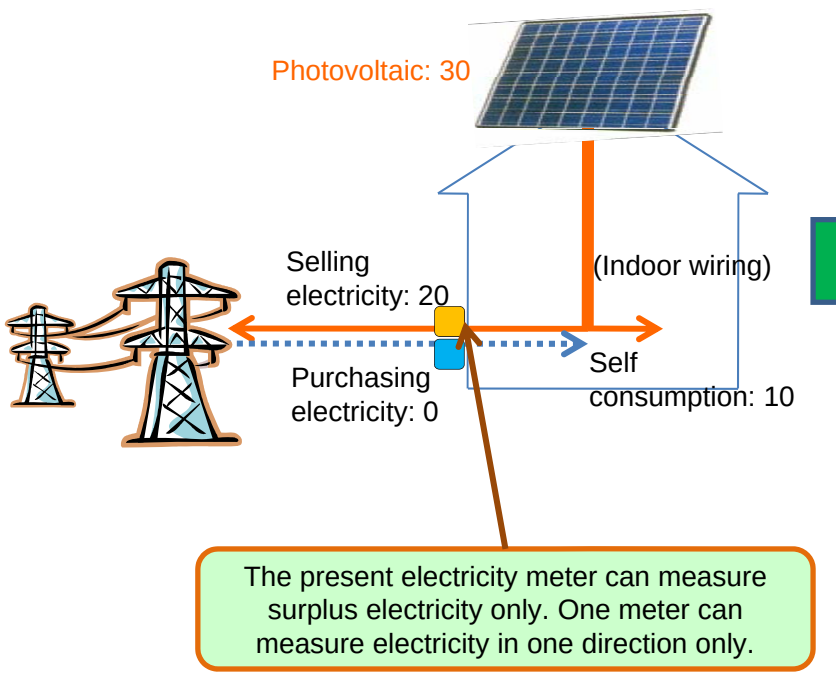
(1) **Incentives for** daytime **energy conservation** at residences.
(2) **Promotion of energy self sufficiency**.
(3) **Increase in the burden on the population** (if the same purchase price applies to the total purchase system, the purchase cost will be increased by approximately ¥260 billion 10 years after the introduction of the system).
(4) **Requires meter transfer and additional wiring work** (after the purchase period expires, wiring work may be required again).
(5) **After the purchase price for photovoltaic electricity falls below the electric power rate for residents in the near future, the surplus purchase system will be advantageous to installers)**.

[Examples of items of future study]
- Assuming that all electricity is purchased if the wiring work is provided, consider making it possible for the installer to make a choice in the future. However, since the introduction incentive based on the total purchase should not exceed the surplus purchase from the viewpoint above, the purchase price of the total purchase system will be considerably lower than that of the surplus purchase.
- Also study specific methods for improving the incentive for introduction at installers whose surplus ratio is significantly low on average (plants, schools, etc.), and for setting the boundary between the scope of total purchase and the scope of surplus purchase.

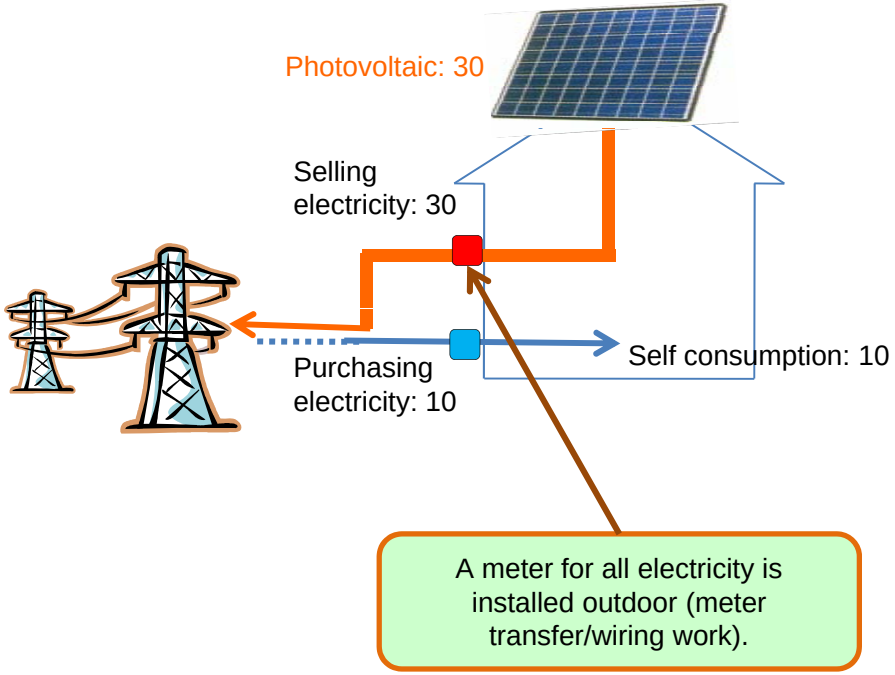
(Reference) Technical Differences between Surplus Purchase & Total Purchase

○ If the present system completely shifted to total purchase, meter transfer and additional wiring work would be required in order to measure the generated electricity (all electricity) at residents where panels are already installed (approx. 500,000 residents).
- Approx. ¥100,000 per resident (approx. ¥50 billion in total for approx. 500,000 residents)
- The number of residents newly installing solar panels per year is currently approximately 120,000 to 130,000.

<Wiring diagram of surplus purchase>



<Wiring diagram of total purchase>



C. Treatment of Newly Installed Systems or Existing Systems

○ Newly installed systems will be covered in principle in order to promote new introduction. However, to prevent the operation of existing systems from being significantly affected, some form of action should be taken such as providing a difference in purchase price.

✓ From the viewpoint of promoting expanded introduction of renewable energy, **newly installed systems will be covered by the purchase system in principle**.

✓ If no action were taken for existing systems in case of abolition of the RPS system, power generation businesses may not be able to continue their operation. Therefore, some form of action should be taken **for existing systems, such as providing a difference in purchase price**.

D. Purchase Price / E. Purchase Period

- ○ The purchase price excluding the photovoltaic systems or the like indicated below should be at a level that enables the installation of standard renewable energy-based systems and is internationally competitive, and should be set at approximately ¥15 to ¥20/kWh in principle. In addition, to promote reduction of the power generation cost through competition among energy sources, a single purchase price should be set.
- ○ The purchase price for photovoltaic systems or the like, whose prices are expected to be reduced, should initially be set at a high level in order to achieve price reduction early, then reduced in stages.
- ○ The purchase period excluding photovoltaic systems or the like should be set at 15 to 20 years in principle while referring to amortization period of facilities, etc. The purchase period for photovoltaic systems or the like should be 10 years.

✓ For those excluding photovoltaic system or the like indicated below, a **single purchase price and period** should be set in principle.

- The purchase price should be set at a level that enables competitively-priced renewable energy sources to be economically operable and is internationally comparable, and be **approximately ¥15 to ¥20/kWh in principle** as proposed in the option. Subsequently, while keeping in mind that the purchase price is directly connected to the burden on the population, it should be finally determined while seeing the tax for a global warming countermeasure, which will also serve as the burden on the population, and the developments of discussions on international emission trading systems.
- To aim at introducing many renewable energy sources at the same cost while suppressing the burden on the population, single purchase price and period should be set in principle. This will enable us to **promote competition among renewable energy sources** and promote reduction of power generation costs with these renewable energy sources.

✓ The purchase price for **photovoltaic systems or the like**, whose prices are expected to be reduced, should initially be **set at a high level in order to achieve price reduction early, then reduced in stages**. For residential photovoltaic systems or the like, **the purchase period should be 10 years** in the light of the cost recovery at residences in short periods and the consistency with the existing system.

- Small wind power generation systems should be treated in the same manner as residential photovoltaic systems in the light of the room for price reduction.

(Reference) Amount of Purchase Cost to be Borne

○ For example, the total amount of the purchase cost in Case 4 (10 years after the start of the system) is as follows.

* Case 4: Renewable energy sources already in practical use / purchasing all electricity in principle (purchasing surplus electricity in case of residential photovoltaic systems or the like) / newly installed systems only / a single purchase price

	Purchase cost (¥100 million/year)	Amount to be borne per kWh (¥/kWh)	Amount of purchase cost to be borne (¥/month)		
			Standard household *2	Medium-scale plant *3	Large-scale plant *4
Total purchase system purchase at ¥15 for 15 years *1	4,622	0.5	150	125,000	1,200,000
Total purchase system purchase at ¥20 for 20 years *1	6,292	0.68	204	170,000	1,632,000
[Reference] Existing system (photovoltaic surplus purchase)	3,118	0.34	102	85,000	816,000

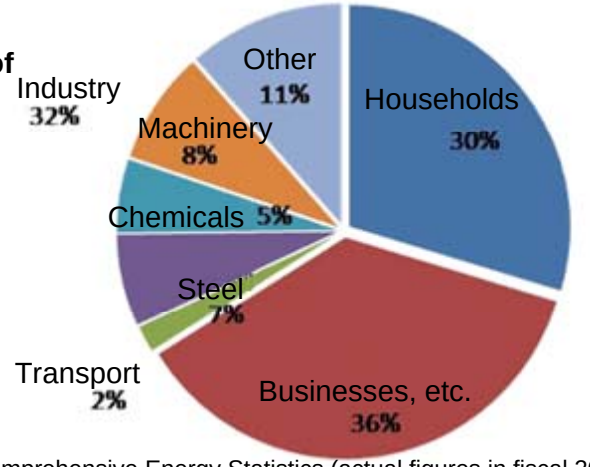
*1. Purchase price/period for energy sources other than photovoltaic systems

*2. The electricity usage at a standard residence is assumed to be 300 kWh/month.

*3. The electricity usage at a medium-scale plant is assumed to be 250,000 kWh/month.

*4. The electricity usage at a large-scale plant is assumed to be 2,400,000 kWh/month.

(Reference) Breakdown of electricity usage by sectors



(*) Excerpt from Comprehensive Energy Statistics (actual figures in fiscal 2008)

F. Method for Bearing the Cost / H. Relief Measures

- From the viewpoint of progressing the improvement of self-sufficiency of energy supply and the environment friendliness of the power sector with this system, and stably implementing a system for recovering the purchase cost, a method of topping up the electricity rate should be adopted while referring to examples in foreign countries in principle.
- From the viewpoint that all power consumers should fairly bear the cost, a method of allocating the cost according to the electricity usage should be adopted in principle.

✓ For the cost bearing method, etc., **a method of topping up the electricity rate should be adopted in principle**, and while seeing the tax for a global warming countermeasure and the developments of discussions on international emissions trading systems, study how the method should be when it is necessary.

✓ **A method of fairly allocating the cost according to the electricity usage should be adopted in principle**.

- Some members expressed their opinions that relief measures should be provided from various viewpoints such as helping lower income individuals, power-intensive industries and small to medium enterprises. However, it should be borne in mind that provision of relief measures in a certain sector in relation to the bearing of the purchase system cost would increase the amount to be borne by other sectors.

G. Inter-regional Adjustments

- To ensure fairness of cost bearing among regions when expanding the purchase coverage in a situation where conditions for introducing renewable energy sources vary with regions, inter-regional adjustments should be made in principle.

✓ **Inter-regional adjustments should be made in principle**.

- It is estimated that there will be a relative difference in the amount of the introduced renewable energy according to the conditions such as the amount of sunlight (photovoltaic), wind conditions (wind power), storage of raw material/resource (geothermal, biomass), and limit in securing the site (all energy sources).
- In addition, considering that the expansion of renewable energy introduction is a project that should normally be implemented on a national scale, inter-regional adjustments should be made so that the burden on consumers will be equal regardless of the region in principle.

Measures to Stabilize the Power System

- ○ As a measure to stabilize the power system, an optimal method that enables maximized introduction of renewable energy while minimizing the burden on the population through efforts such as installing batteries, and suppression of the output of photovoltaic systems, in preparation for days where power demand is especially weak, should be studied in the future.
- ○ In addition, review the system as necessary while seeing the technological development trend concerning system stabilization in the future, and the actual impact on the system.

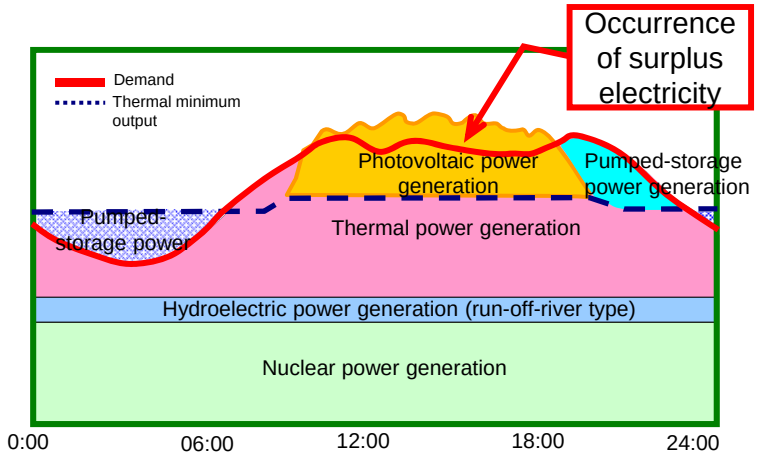
✓ As measures to stabilize the system in case of mass introduction of renewable energy sources such as photovoltaic systems, it will be necessary to respond to surplus electricity, secure frequency adjustment capability, and take a measure to increase the voltage.

✓ In particular, as a measure to deal with surplus electricity, it may become necessary to appropriately control the output after some point based on the understanding of the population from the viewpoint of reducing the social cost, while taking into account factors such as the pace of introducing photovoltaic systems, production capacity for batteries, and trends in technological development related to so-called “smart grids.”

✓ Based on the above, discussions have just started at the Conference on Reviewing a System for a Next-Generation Power Transmission and Distribution System concerning the technologies, rules, etc. related to the next-generation power transmission and distribution system.

Result of estimating the amount to be borne related to the measures to stabilize the system

Measure	Total amount to be borne until 2020	Annual amount to be borne as of 2020
(1) Suppressing output for 30 days per year (all electricity)	¥1.46 trillion	¥0.22 trillion
(2) Suppressing output for 14 days per year (all electricity)	¥4.27 trillion	¥0.89 trillion
(3) Suppressing output by half for 14 days per year (half electricity)	¥9.46 trillion	¥1.78 trillion
(4) No output suppression	¥18.01 trillion	¥3.43 trillion



The sum of the base supply capacity (minimum output of nuclear + hydroelectric + thermal) and the photovoltaic generated power exceeds the demand in low-demand period, and surplus electricity occurs (figure above).

Others

- To achieve the above system, proceed with a study of the legal aspects including the abolition of the RPS Act.
- Concerning the subsidy for photovoltaic systems for residences, continue it for the time being while appropriately reviewing it, thus to reduce the initial cost burden of general households and to facilitate reduction of the system price.
- Concerning the installation of renewable energy systems, it is also important to improve the environment for its introduction such as appropriately reviewing the regulations, and ensuring fair and transparent power systems.
- While keeping an eye on the amount of renewable energy introduced, expeditiously review the system as necessary, approximately 3 to 5 years later.
- Also study other points at issue (details of the system design, etc.) in a matter-of-fact manner in the future.

Forecast of the Introduced Amount (estimate)

- If Case 4 presented in the options for the system is followed, the introduced amount will increase by approximately 32 to 35 million kW in the tenth year after the introduction of the system.
- For example, photovoltaic generated electricity will increase by approximately 27.80 million kW and wind generated electricity will increase by approximately 28 to 53 million kW.

(Unit: 10,000 kW)

	Total	Photovoltaic	Wind	Small to medium hydroelectric	Geothermal	Biomass
Present (2009)	1,470	210	220	990	50	0
Added amount introduced (forecast)	+3,200 to +3,500	+2,780	+280 to +530	+30 to +70	+20 to +50	+50

(Note) As we estimated the introduction amount 10 years later on the assumption that the development will start from profitable locations while taking into account the generated electricity, construction cost, wind conditions, etc. under the condition that electricity will be purchased at ¥15 to ¥20 for 15 to 20 years, the result as shown above was produced.
That of biomass power generation is estimated for a case where unused logging residue biomasses are used for power generation for convenience.

Photovoltaic systems

- ✓ The **system price is estimated to be significantly reduced** due to expanded demand.
- ✓ The number of residences newly installed with solar panels will be increased **by approximately 500,000 per year** (approx. 400,000 residences will be newly built per year).
- ✓ The above pace is **three times or more faster than 2009**, when a record-high introduced amount was marked thanks to the start of the subsidy for residential photovoltaic systems and the establishment of the surplus purchase system (the introduced amount will be increased in 2020 by approximately 20 times from 2005).

Wind power generation systems

- ✓ New wind power generation systems will be increased at a pace of **approximately 200,000 to 450,000 kW/year**.
- ✓ The above pace is **approximately twice the present pace (approx. 200,000 kW/year)** (the introduced amount will be increased in 2020 by approximately 2.3 to 3.4 times from 2009).
- ✓ In addition to approximately 1,500 wind power generation systems (1,000 to 1,500 kW class) currently in service, aim at **newly building 14,00 to 2,600 units** after the start of the system.

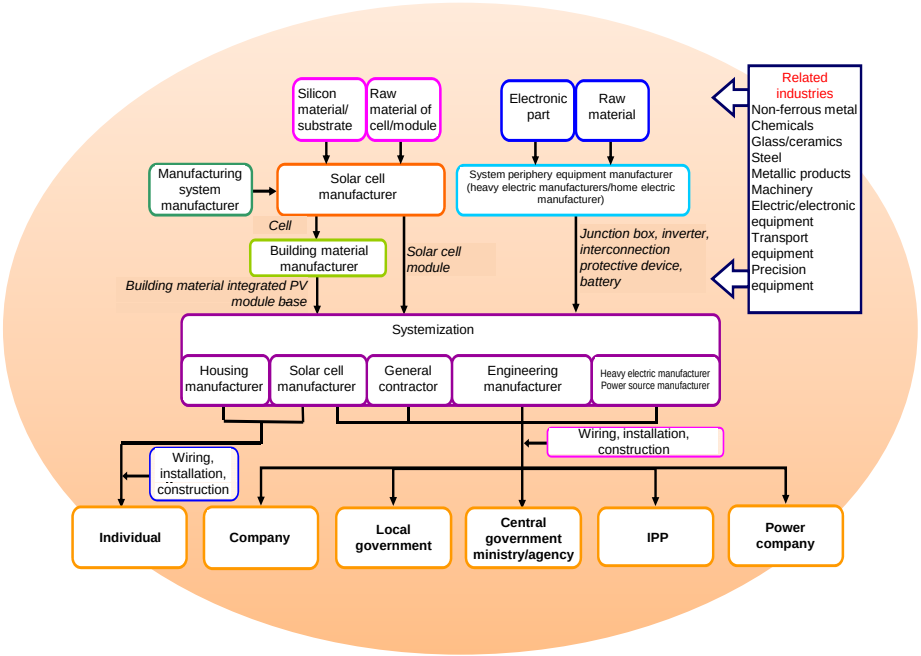
Burden on the Population and Economic Effects

○ Aim at expanding the renewable energy-related market to ¥10 trillion by 2020 through expansion of the introduction of renewable energy, etc. for example by implementing the feed-in tariff scheme for renewable energy.

✓ If the case presented in a framework of the system (proposal based on option Case 4) were adopted, the total amount of the purchase cost would be approximately ¥460 to ¥630 billion 10 years after the start of the system.

✓ In the meantime, the renewable energy-related industry has features including a broad base, such as solar cell manufacturers, member manufacturers, dealers and builder's offices for photovoltaic systems, equipment manufacturers and installation companies for wind power generation systems, and plant manufacturers and forestry companies for biomass power generation systems, as well as an extensive relationship with local economies, and is therefore expected to produce high economic effect and employment effect.

[Ex. photovoltaic industry]



[Growth of the domestic market]